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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER	
FETZNER,T	
ART UNIT	PAPER NUMBER
2862	

DATE MAILED: 10/09/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

PTO-90C (Rev. 2/95)

1- File Copy

Office Action Summary	Application No. 09/535,241	Applicant(s) Tsuda, Munetaka
	Examiner Tiffany A. Fetzner	Art Unit 2862

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Mar 27, 2000*

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle* 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-13* is/are pending in the applica

4a) Of the above, claim(s) ______ is/are withdrawn from considera

5) ☐ Claim(s) ______ is/are allowed.

6) ☒ Claim(s) *1-13* is/are rejected.

7) ☐ Claim(s) ______ is/are objected to.

8) ☐ Claims ______ are subject to restriction and/or election requirem

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on ______ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on ______ is: a)☐ approved b)☐disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a)☐ All b) ☒ Some* c) ☐None of:

1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ______ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☒ Notice of References Cited (PTO-892)

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). ______

18) ☐ Interview Summary (PTO-413) Paper No(s). ______

19) ☐ Notice of Informal Patent Application (PTO-152)

20) ☐ Other:

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of **35 U.S.C. 102** that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. *Claim Rejections - 35 USC § 103*

4. The following is a quotation of **35 U.S.C. 103(a)** which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. **Claims 1-13** are rejected under **35 U.S.C. 102(b)** as anticipated by **Ishihara et al.**, US patent 5,378,987 issued January third 1995; filed March 11th 1993; or, in the alternative, **Claims 1-13** are rejected under **35 U.S.C. 103(a)** as being unpatentable over **Ishihara et al.**, US patent 5,378,987 issued January third 1995; filed March 11th 1993.

7. With respect to **Claim 1, Ishihara et al.**, teaches a nuclear "magnetic resonance" imaging apparatus comprising: a static magnetic field generating unit that generates a static magnetic field of a constant magnetic field intensity;" [See Figure 1 main magnet 10, col. 4 lines 50-54] "an gradient magnetic field generating unit that generates a magnetic field strength gradient;" [See Figure 1 gradient coil system 12, and gradient coil power source 13; col. 4 lines 55-59] "a high-frequency magnetic field generating unit; [See col. 7 lines 35-61, col. 8 lines 47-49; col. 4 line 63 through col. 5 line 4; Figure 1: component 16, the RF probe which applies RF pulses, and component 17, the RF transmitter which supplies the RF pulses to the probe. Components 16 and 17 are interpreted by the examiner as comprising a "high-frequency magnetic field generating unit" because the RF pulses of components 16, and 17 and used with gradient coil system 12 to perform are ultra high speed/frequency imaging.] **Ishihara et al.**, teaches "a detecting unit" (i.e. receiver 18) "that detects" (i.e. receives) "nuclear magnetic resonance signals generated from an object to be examined" (i.e. the target body of the patient, or subject that is being scanned by probe 16 and the entire system of Figure 1 in general); [See Figure 1: receiver component 18, col. 4 line 68 through col. 5 line 12]

8. **Ishihara et al.**, also teaches "a display unit that displays a result of the detection, [See Figure 1 component 9, col. 5 lines 10-12] "wherein the magnetic resonance imaging apparatus

further comprises: a magnetic field correcting unit" (i.e. shim coil system 14) "that generates an additional magnetic field for making uniform a space distribution of the static magnetic field;" [See col. 4 lines 59-61; Figure 1 component 14] "a temperature detecting unit that detects a temperature of the static magnetic field generating unit and/or surroundings thereof;" [See Figure 1: heating device 21, and heating control device 22; col. 5 lines 7-10; col. 5 line 19 through col. 7 line 35 which provides a detailed description of how the temperature and temperature distribution is detected both before and after heat is applied to a patient. The examiner notes that the entire reference applies to this limitation in general as the temperature detecting unit can be additionally interpreted as the interaction of the components of Figure 1, since the measurement of the temperature distribution within a body through the use of NMR is the goal of the **Ishihara et al.**, reference.] Additionally, **Ishihara et al.**, teaches "a control unit" (i.e. sequence controller 19) "that controls the magnetic field correcting unit;" (i.e. the shim coil power source 15 / system 14 of figure 1) "based on the temperature detected by the temperature-detecting unit." [See Figure 1, col. 5 lines 1-12; col. 8 lines 7-10, and the entire reference in general.]

9. With respect to **Claim 2**, **Ishihara et al.**, teaches and suggests "the control unit has a temperature setting unit that sets a temperature detected by the temperature-detecting unit." [See col 7 lines 30-35; and col. 7 lines 161 in general, where ΔT is the temperature change, and $\Delta\tau$ the period of the pulse sequence, is adjusted based on the amount of temperature change ΔT desired, therefore the amount of temperature change ΔT, which inherently includes the minimum and maximum temperatures, is set and controlled by the apparatus of **Ishihara et al.**,] The same reasons for rejection, that apply to **claim 1** also apply to **claim 2**.

10. With respect to **Claim 3**, **Ishihara et al.**, teaches and suggests that "the temperature detecting unit detects temperatures of at least two positions." [See col. 7 line 62 through col. 10 line 45 which teaches determining the temperatures, and temperature shifts of multiple chemical shift components at more than one location] The same reasons for rejection, that apply to **claim 1** also apply to **claim 3**.

11. With respect to **Claim 4**, **Ishihara et al.**, teaches and shows that "the magnetic field correcting unit comprises a shim coil" (i.e. component 14 in Figure 1) "for generating an additional magnetic field and a shim power source" (i.e. component 15 in Figure 1) that supplies a current to the shim coil." [See col. 4 line 59 through col. 5 line 4] The same reasons for rejection, that apply to **claim 1** also apply to **claim 4**.

12. With respect to **Claim 5**, **Ishihara et al.**, lacks teaching that "the control unit" (i.e. sequence controller 19) "comprises a voltage generating unit that generates a voltage corresponding to an ununiformity component of the magnetic field at the temperature detected by the temperature detecting unit, a voltage/current converter that converts the voltage output by the voltage generating unit to current, and a supplying unit that supplies to the magnetic field correcting unit the current generated from the voltage/current converter." However, Figure 1 of **Ishihara et al.**, illustrates that sequence controller 19 controls shim power source 19. It is also well established that conventionally, power defines the relationship between voltage and current. Therefore, shim coil power supply 15 generates and regulates both the voltage and the current applied to the shim coil system 14. Because the purpose of shim coil 14 is to adjust the homogeneity of the static magnetic field, it is considered inherent that the shim coil power source

15 comprises a voltage generating unit, and that the inherent voltage generating unit of component 15, "generates a voltage corresponding to an ununiformity component of the magnetic field".

13. The relationship of temperature, temperature change and temperature distribution to the static magnetic field homogeneity is also taught by **Ishihara et al.**, [See col. 6 line 24 through col. 7 line 34] therefore, "an ununiformity component of the magnetic field at the temperature detected by the temperature detecting unit" is also suggested by the **Ishihara et al.**, reference. Additionally, **Ishihara et al.**, teaches that the temperature change ΔT influences the inhomogeneity of the static magnetic field, [See col. 6 lines 55-68] and that shim coil system 14, adjusts the homogeneity of the static magnetic field. [See col. 4 lines 59-61, where the examiner is interpreting the adjustments taught as adjustments made to ensure a uniform magnetic field.] Therefore the shim coil power source 15, shown in Figure 1, is also broadly interpreted by the examiner as comprising "a voltage/current converter that converts the voltage output by the" inherent "voltage generating unit" of shim coil power source 15, "to current, and a supplying unit" (i.e. a power source and a power supply are considered equivalent terms) "that supplies to the magnetic field correcting unit" (i.e. shim coil system 14) "the current generated from the voltage/current converter". [See Figure 1] The same reasons for rejection, that apply to **claim 1** also apply to **claim 5**.

14. With respect to **Claim 7**, **Ishihara et al.**, shows and suggests that "the temperature detecting unit is disposed near the static magnetic field generating unit and/or in a room where the

static magnetic field generating unit is placed." [See Figure 1, which suggests that all of the components are in close proximity to one another, or in a single defined area, (i.e. a room).]

15. With respect to **Claim 8, Ishihara et al.**, teaches and suggests "A method of maintaining a static magnetic field generated by a static magnetic field generating unit uniform in a magnetic resonance imaging apparatus, by generating an additional magnetic field, (i.e. **Ishihara et al.**, controls the gradients and the shim coil system 14 to keep the static field uniform) the method comprising the steps of: calculating a temperature dependence of an ununiform component of a space distribution (i.e. the chemical shift components, that affect the shielding constant) of the static magnetic field." [See col. 5 lines 16-66; and col. 6 line 55 through col. 7 line 8, where **Ishihara et al.**, teaches obtaining the temperature change in which the influence of the static magnetic field and chemical shift difference are removed from the phase difference distribution before the heating, and the phase difference distribution after the heating.] **Ishihara et al.**,suggests "detecting a temperature of the static magnetic field generating unit;" [See δBH in equation 9] "and calculating a strength of the additional magnetic field" [See col. 10 lines 22-25, which teaches adjusting (i.e. calculating) gradient magnetic fields to nullify phase changes "based on the detected temperature and the temperature dependence" of the temperature independent regions, and the temperature dependent region; See col. 9 lines 35-43]

16. With respect to **Claim 6**, and corresponding **claim 12** which depends from **claim 8**, **Ishihara et al.**, teaches and suggests that "the magnetic field correcting unit generates at least one additional magnetic field of linear term of y, quadratic term of z and quartic term of z, where z is the direction of the static magnetic field and y is one direction orthogonal to z." [See col. 6

line 18 through col. 7 line 61. The examiner considers correcting the inhomogeneity of the static magnetic field, which is taught in col. 6 and performed with the equations from col. 6 and col. 7 by the shim coil system 14, as a direct suggestion and teaching of the above mathematical relation.]

17. With respect to **Claim 10, Ishihara et al.**, suggests that the "steps from the temperature detection to the generation of the additional magnetic field are conducted at predetermined time intervals." [See col. 6 line 55 through col. 7 line 8; col. 9 lines 35-43; col. 10 lines 22-25, and the entire reference in general as concerns temperature measurements before and after heating.] The same reasons for rejection, that apply to **claim 8** also apply to **claim 10**. The same reasons for rejection, that apply to **claims 1, 8** also apply to **claims 6, 12** respectively.

18. With respect to **Claim 11, Ishihara et al.**, teaches and suggests "measuring NMR signals generated from an object to be examined; [See col. 6 lines 24-68 where the detected NMR signals and equation 8 uses the NMR signals to perform measurements of the phase distribution and account for the inhomogeneity of the static magnetic field.] "calculating a magnetic field error component attributable to the object using the measured NMR signals" [See col. 8 line 24 through col. 9 line 68]; and "calculating a strength of the additional magnetic field based on the error component attributable to the object" [See col. 10 lines 1-45]; **Ishihara et al.**, lacks directly teaching the step of "generating an additional magnetic field having an intensity equal to that of the sum of that obtained based on the detected temperature and the temperature dependence and that calculated based on the error component." However, **Ishihara et al.**, teaches nullifying the phase changes (i.e. canceling out or identically matching the signals in an opposite manner such

that the sum is zero). The teaching of nullification of the phase change errors is considered by the examiner to be an equivalent way of stating that the controlled gradient magnetic fields have "an intensity equal to that of the sum of that obtained based on the detected temperature and the temperature dependence and that calculated based on the error component." [See col. 10 lines 1-45] The same reasons for rejection, that apply to **claim 8** also apply to **claim 11**.

19. With respect to **Claim 13**, **Ishihara et al.**, teaches "A magnetic resonance imaging apparatus comprising: a static magnetic field generating means that generates a static magnetic field of a constant magnetic field intensity" [See Figure 1 main magnet 10 and main magnet power source 11], and a uniformity correcting means (i.e. shim coil system 14 shown in Figure , col. 4 lines 59-61) that detects a temperature change affecting the uniformity of the magnetic field generated by the static magnetic field generating means" **Ishihara et al.**, also teaches generating a magnetic field" phase map "for canceling a change of the magnetic field intensity due to a temperature change based on the detected temperature change." [See col. 6 line 25 through col. 10 line 45; the canceling out or nullification of magnetic fields by adjusting the phase map acquired based on temperature changes and the temperature distribution is taught in col. 10. The examiner notes that a magnetic field phase map, maps the distribution of the phases across generated magnetic fields.]

20. With respect to **Claim 9**, **Ishihara et al.**, lacks teaching that the "steps from the temperature detection to the generation of the additional magnetic field are conducted at all times." However, modifying the method of **Ishihara et al.**, to perform the "steps from the temperature detection to the generation of the additional magnetic field are conducted at all

times", would have been obvious to one of ordinary skill in the art, at the time that the invention was made because one of ordinary skill in the art, would already be aware that the ability to conduct temperature distribution measurements before and after heating, is also suggestive of the ability to perform continuous measurements to monitor the temperature distribution. Therefore, performing the steps of claim 9 continuously as opposed to predetermined time intervals is considered an obvious variation of **Ishihara et al.**, by the examiner. The same reasons for rejection, that apply to **claim 8** also apply to **claim 9**.

21. **Prior Art** of **Record**

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

A) **Ishihara et al.**, US patent 6,194,899 B1 issued February 27th 2001; filed February 17th 1999.

Conclusion

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is (703) 305-0430. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

24. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams, can be reached on (703) 305-4705. The fax phone number for the organization where this application or proceeding is assigned is (703)305-3432 .

25. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0956.

Tiffany A. Fetzner

TAF

September 27, 2001

Hezron E. Williams

HEZRON WILLIAMS
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